TABLE OF CONTENTS

Page

Introduction 1

Specifications 2

Abbreviations 2

Precautions 3

Test Equipment Required 3

Maintenance Schedule 3

Equipment Description 4

Control Panel Description 5

Operating Instructions 6

Servicing Information:

- General 7
- Theory of Operation 7
- Calibration Procedures 8
- Fuse Replacement 10
- Cleaning 10
- Troubleshooting Guide 11

Parts List 12

Drawings 13

Block Diagram
A/D Control Logic Diagram
Timer/Display Logic Diagram
P/S - R/F Board Schematic
A/D Control Board Assembly
Timer/Display Board Assembly
P/S - R/F Board Assembly

2/92 250 IR6-18

INTRODUCTION

It is recommended that all servicing of the Sonicator 706 be performed at the factory where experienced technicians and the appropriate equipment are available for the prompt and efficient repair and recalibration of this device.

Should it not be possible to return the device to the factory for repair, this manual offers the necessary guidance to locate potential problems to the major component level. Major components, as listed in the parts list at the end of this manual, should be repaired at the factory as a secondary alternative to returning the entire unit to the factory.

This service manual is designed to provide maintenance guidance to qualified service technicians sufficient to insure that the Sonicator 706 continues to function in accordance with applicable specifications and the performance standards for ultrasound therapy devices listed in 21 CFR 1050.10 (Code of Federal Regulations).

The preventive and corrective maintenance procedures provided herein should be performed by qualified service personnel only using the recommended electronic measurement equipment.

This manual should be read and understood thoroughly before attempting any servicing procedures. If there is any doubt as to the correct course of action in the accomplishment of repairs, contact the Service Department at the factory, or return the unit to the factory with an explanatory note describing the problem in as much detail as possible.

SPECIFICATIONS

Input: 120VAC ± 10%, 60Hz, .5-amp max.

Frequency: 1.0 MHz ± 5%

Pulse Repetition Rate: 100 Hz ± 20%

Pulse Duration: 2 msec ± 20%

Temporal Peak/Average Intensity Ratio: 5 ± 20%

Indication Accuracy: ± 20% for any reading above 10% of the maximum

APPLICATOR:

Ceramic: Barium Titanate

Frequency: 1.0 MHz ± 5%

Effective Radiating Area (ERA): 10 cm^2 ± 20%

Type: Collimating

Beam Non-uniformity Ratio: 6.0 max.

TIMER:

Accuracy: ±0.5 minutes for times less than 5 minutes
±10% for 5 to 10 minutes
±1.0 minutes for times greater than 10 minutes

Maximum Treatment Time: 29 minutes

ABBREVIATIONS

W - watts

W/cm^2 - watts per square centimeter

CW - continuous waveform

msec - milliseconds

ERA Area - effective radiating area

S/N - serial number

A/D - analog-to-digital

P/S - power supply

R/F - radio frequency

BNR - beam nonuniformity ratio

Coll - collinating

MHz - megahertz

PRECAUTIONS

1. Servicing of the Sonicator ME 706 should be performed by qualified service technicians only.

2. This manual should be read and understood thoroughly before attempting any service procedures.

3. Use of controls, adjustments, or performance of procedures other than those specified in this manual may result in hazardous exposure to ultrasonic energy.

4. Line supply voltages are present inside the ME 706 enclosure when connected to the AC outlet. Disconnect the unit from the power source during disassembly.

5. Measure the ground resistance between the auxiliary connection jack and the line cord plug ground pin and between the ring around the piezoelectric disc and the line cord plug ground pin. Results should be one ohm or less.

6. Do not operate the unit with the applicator in free air for more than a few seconds. The Sonicator ME 706 is designed to automatically terminate ultrasonic power when the applicator is unloaded.

TEST EQUIPMENT REQUIRED

1. Multimeter with AC/DC volts and ohms scales.

2. Calibrated ultrasound power meter.

3. Hipot tester.

4. Leakage current tester.

5. Degassed water (for the power meter).

6. Dual channel 35MHz oscilloscope.

MAINTENANCE SCHEDULE

To assure continued compliance with 21 CFR 1050.10, FDA, the Sonicator ME 706 should be factory-calibrated and safety tested annually. It is recommended that this annual maintenance requirement be performed at the factory.

EQUIPMENT DESCRIPTION

GENERAL:

The Sonicator ME 706 is a single unit, molded plastic enclosed ultrasound therapy device with a built-in applicator. It consists of four printed circuit boards, power transformer assembly, control panel membrane switch assembly, main power switch, intensity control, and inter/connections. This section briefly describes these subassemblies. Refer to the appropriate drawings in the appendix at the end of this manual.

MAJOR SUBASSEMBLIES:

P/S - R/F Control Board - contains the power supply, RF circuits, two regulated 12-volt power supplies, switching regulator, overload sensor, RF power level sensor circuit, timer clock reference, AC input line fuses, and input line RFI filters.

A/D Control Board - contains the analog-to-digital converter, pulse oscillator, power indicator scaling adjustment, and a 5-volt regulated power supply.

Timer Display Board - contains the timer keyboard entry logic, timer logic, timer display, power indicator display, meter selection indicators (W or W/cm^2), mode indicators (CW or PULSE), power on reset and overload controller.

Buzzer Board - small pcb containing buzzer signal control circuit.

Applicator - an integrated unit consisting of a glass-coated piezoelectric ceramic disc in a molded plastic handle with cable, strain-relief and connector. It is connected directly to the RF output at the P/S - R/F board within the generator enclosure.

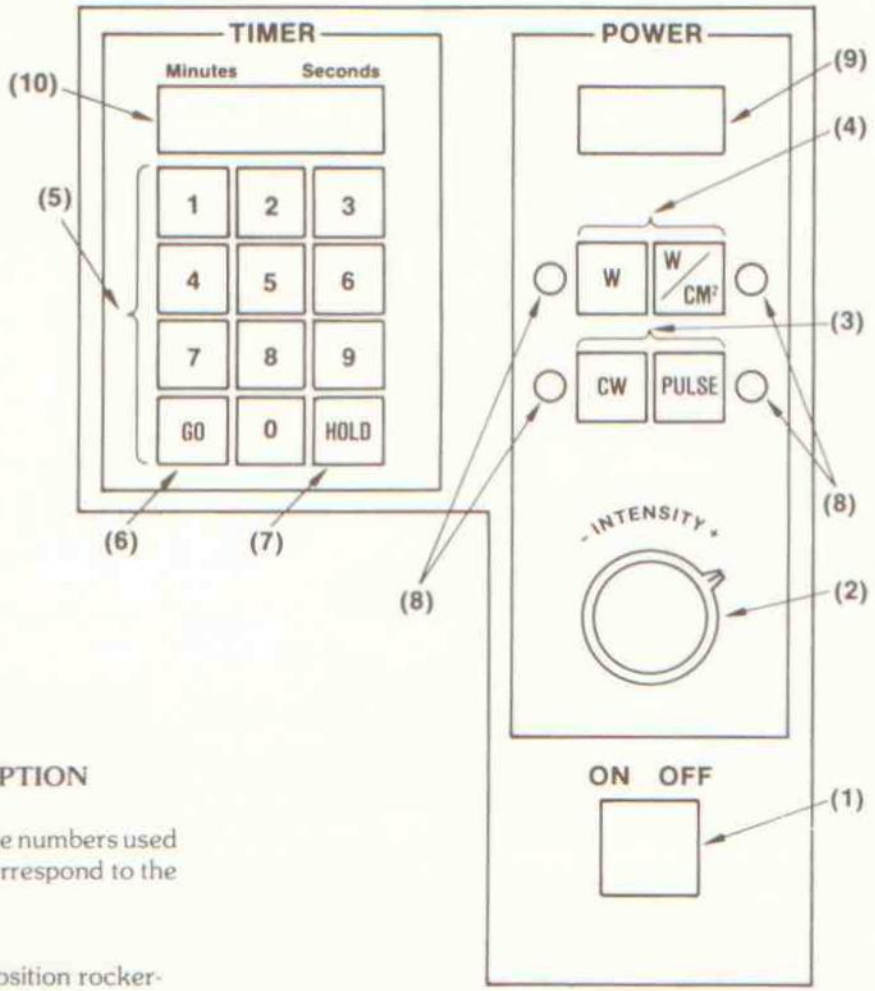
OTHER COMPONENTS:

The membrane switch, intensity control, power switch and power transformer are all mounted on and under the generator front housing.

SUBASSEMBLY CONNECTIONS:

All subassemblies are interconnected with cable assemblies and connectors. The connectors cannot be connected to the wrong plugs without excessive force, or obvious error. Connector interlock keys are provided where necessary.

SONICATOR CONTROL PANEL



CONTROL PANEL DESCRIPTION

Refer to the control panel drawing. The numbers used for the controls and indicators below correspond to the numbers shown in the drawing.

(1) **Main Power Control** — A two-position rocker-type ON/OFF selector.

(2) **Power Level Control** — Determines the output level as indicated on the power output indicator.

(3) **Mode Selector** — Selects either continuous-wave (CW), or pulse-modulated (PULSE) operation. Initial turn-on is in CW mode.

(4) **Indicator Function Selector** — Determines one of two types of indication provided by the power output indicator (W or W/cm²). Initial turn-on is in W mode.

(5) **Treatment Time Selector** — Allows selection of treatment times from zero to 29 minutes as indicated on the treatment time indicator.

(6) **'GO' Switch** — Selecting this function activates the timer (which counts down in one second intervals) and the ultrasonic power.

(7) **'HOLD' Switch** — Selecting this function stops the timer (which remains in a hold state at the indicated time remaining) and turns off the ultrasonic power.

(8) **Indicator Lights** — Green LED (light emitting diode) indicators for each power output indicator function (W and W/cm²) and for each mode (CW and PULSE). Two of these indicators are lit during Sonicator operation, one each for indicator function and mode selected.

(9) **Power Output Indicator** — Provides indication of ultrasonic power output.

W — In CW mode the indicator displays average ultrasonic power in watts. In PULSE mode it displays peak pulse ultrasonic power in watts.

W/cm² — In CW mode the indicator displays average effective intensity in watts per square centimeter. In PULSE mode it displays peak pulse effective intensity in watts per square centimeter.

(10) **Treatment Time Indicator** — Indicates treatment time selected and displays remaining time when the timer is activated. (Power output automatically drops to zero watts at the end of the selected treatment time and a long audible "beep" sound will be generated.)

OPERATING INSTRUCTIONS

Refer to the control panel drawing. Numbers in the following operating procedures, for example (1), indicate the control or indicator number shown in the drawing.

1. Connect the unit to an appropriately grounded 120 VAC, 60Hz receptacle.

2. Energize the unit by pressing the MAIN POWER CONTROL (1). to the left.

3. Enter the treatment time using the TREATMENT TIME SELECTOR (5). The treatment time must be entered using two digits.
   a. For times up to 9 minutes, enter '0' followed by the second digit.
      Example : For 9 minutes, enter a '0' then a '9'.
   b. For 10 to 29 minutes, enter a '1' or '2' followed by the second digit.
      Example: For 15 minutes, enter a '1' the a '5'.
   c. If an incorrect time is entered accidentally, cycle the MAIN POWER CONTROL (1) and reselect the desired treatment time.

4. Select continuous-wave (CW) or pulse-modulated (PULSE) mode by pressing the appropriate MODE SELECTOR (3) function.

5. Select the desired power output indication by pressing the appropriate INDICATOR FUNCTION SELECTOR (4) switch (W or W/cm^2).

6. Immerse the ultrasound applicator head in water.

7. Press the 'GO' SWITCH (6) to initiate treatment time and power output.
   a. Treatment time (and power output) can be stopped by pressing the 'HOLD' SWITCH (7). The TREATMENT TIME INDICATOR (10) will indicate the time remaining.
   b. Restart the unit by pressing the 'GO' SWITCH (6). The timer will commence countdown from the time remaining.
   c. A buzzer automatically sounds at the end of the selected treatment time.
   d. If the treatment is interrupted due to to lack of coupling at the applicator head, the buzzer will sound four or five times indicating that time is remaining. The output power will then drop to zero watts.

8. Adjust the POWER LEVEL CONTROL (2) to the desired power output level as indicated on the POWER OUTPUT INDICATOR (9).

SERVICING INFORMATION

GENERAL:

The remainder of the manual contains the theory of operation, calibration procedures, and troubleshooting guidelines for the Sonicator ME 706. The technician should be thoroughly familiar with the descriptions and operating instructions presented at the beginning of this manual before attempting to service the device. For the theory of operation and calibration sections, refer to the appropriate drawings located in the appendix at the end of this manual.

THEORY OF OPERATION

Timer Display Enable Circuits — The digital timer is programmed by the front panel membrane switch signal entry to the timer circuit. Time must be entered as two digits (as discussed in the operating procedures). The timer output is displayed on the front panel by the TREATMENT TIME INDICATOR. After programming the timer, the treatment is started by pressing the 'GO' SWITCH. The timer can be stopped by pushing the 'HOLD' SWITCH, or by an overload due to the lack of coupling at the applicator head, or at the end of the selected treatment time. The TREATMENT TIME INDICATOR displays the remaining treatment time. The timer, and treatment, can then be resumed by pressing the 'GO' SWITCH. The timer activates the buzzer for approximately two seconds at the end of the selected treatment time.

Power Supply — A switching power supply is used to control the voltage to the RF stage which in turn controls the power output from the unit. The power supply voltage output is controlled by a feedback comparing the front panel power adjustment with an RF power monitor to maintain the proper power level. The power supply is turned on by the enable signal which is present when the timer is running and the unit is in the CW MODE. In the PULSE MODE the power supply is pulsed on and off at the 100 Hz pulse frequency by the enable signal.

RF Oscillator — The RF oscillator is a push-pull transistor circuit which operates when the switching power supply output voltage is present. The output is fed through a coupling transformer to the applicator. A feedback output from the applicator circuit is fed back to the power supply to be compared to a reference for power output control.

When the applicator is unloaded the overload is sensed and fed back to enable the hold condition which in turn stops the timer and power output. The RF oscillator is tuned to the piezoelectric ceramic disc frequency for maximum power transfer.

Applicator — The RF output from the RF section is transmitted to the piezoelectric ceramic disc by a double-shielded coaxial cable. The center wire of the coax is connected to the silver electrode on the back of the disc. The face electrode, transducer cup, and coax shield are connected to ground through the ground system. Both shields are connected to the face electrode through the stainless steel cup used to mount the disc.

Power Meter — The analog voltage input to the RF circuits is squared in a squaring circuit to provide an analog voltage proportional to the ultrasound power output. The analog output is converted to a digital output in the A/D converter which in turn drives the power meter display. The meter function controls (W or W/cm^2) enable the decimal point position to provide an output reading in watts or watts per square centimeter.

CALIBRATION PROCEDURES:

CAUTION: *Calibration should be performed by qualified technicians familiar with the operation of the required test equipment and the adjustment of equipment with line voltage present.*

1. Place the applicator in the ultrasound power meter.

   Note: Correct orientation of the applicator in the power meter is required. With the power on, tip the applicator in all directions as required to obtain the highest possible reading, then proceed with the calibration keeping the applicator in this position.

2. Connect the Sonicator to a 120VAC ± 10%, 60Hz line voltage source.

3. Check the AC line voltage with a multimeter. If the line voltage is not the required level, an autotransformer must be used to obtain the proper line voltage.

4. Energize the Sonicator and program 29 minutes on the timer. Select 'W' and 'CW' on the INDICATOR FUNCTION SELECTOR and MODE SELECTOR respectively.

5. Check the Sonicator output at the 5, 10, 15, and 20 watt levels. If the measured values are more than 20% different from the Sonicator indicated values proceed to recalibrate the unit.

Low Level	4W	8W	12W	16W
Desired Level	5W	10W	15W	20W
High Level	6W	12W	18W	24W

6. With AC power disconnected, remove the back cover.

7. Reconnect the Sonicator to the line source. (CAUTION: LIVE HIGH VOLTAGES ARE PRESENT INSIDE THE UNIT.)

8. Repeat step 4.

9. Adjust the Sonicator POWER LEVEL CONTROL to 20 watts as indicated on the ultrasound power meter. Adjust R109 to obtain 20 watts on the POWER OUTPUT INDICATOR. (R109 is located on the A/D Control Board.) The ultrasound power meter should also indicate 20 watts. Readjust the Sonicator POWER LEVEL CONTROL as necessary.

10. Adjust the front panel POWER LEVEL CONTROL for 10 watts as indicated on the ultrasound power meter. Adjust R37 (P/S — R/F Board) for 10 watts on the POWER OUTPUT INDICATOR.

11. Return to step 9 and readjust as necessary until the Sonicator indication is correct at both levels (10 and 20 watts). Alternate between steps 9 and 10 as needed. When the checks listed in step 5 are satisfied, proceed with the following steps.

12. Adjust the Sonicator POWER LEVEL CONTROL for 20 watts on the POWER OUTPUT INDICATOR. Select W/cm^2 and observe that the W/cm^2 indicator lights and that the POWER OUTPUT INDICATOR reads 2.0 W/cm^2.

13. Select 'W' and observe that the 'W' indicator lights and that the POWER OUTPUT INDICATOR reads 20 watts.

14. Select PULSE MODE and observe that the POWER OUTPUT INDICATOR reads approximately 20 watts and the ultrasound power meter reads approximately 4 watts.

15. Select CW MODE and observe that the ultrasound power meter reading changes to 20 watts, ± 20%.

16. Install the back housing and four rubber feet.

17. A safety check for ground resistance, leakage current, and high voltage breakdown is recommended.

    Calibration is complete.

FUSE REPLACEMENT:

Two line fuses are used in the Sonicator. They are located on the P/S — R/F Board (see the P/S — R/F Board assembly drawing in the appendix). Fuse replacement requires removal of the back housing. Use only 1/2-amp, "slo-blo" fuses for replacement to protect against fire hazard.

If it becomes necessary to replace the line fuses, the unit must be recalibrated using the procedures presented in this service manual.

CLEANING:

To clean the molded plastic enclosure of the Sonicator ME 706 generator housing or applicator handle, use a mild detergent with a damp soft cloth. Use of any other cleaning agents or solvents is not warranted or recommended.

TROUBLESHOOTING GUIDE

	SYMPTOM	POSSIBLE CAUSE/ACTION
1.	Will not turn on.	Check input power supply, power cord, fuses and the MAIN POWER SWITCH.
2.	Upon turn-on, timer display indicates EE.EE.	Replace Timer/Display board.
3.	Will not accept timer input.	Check the membrane switch and connections, Timer/Display board, and P/S — R/F board 12V supply.
4.	'GO' will not activate the unit.	Check the membrane switch, inter-board connections, and the Timer/ Display board.
5.	'HOLD will not activate.	Same as 4.
6.	Timer display does not light.	Check inter-board connections, Timer/Display board, and the P/S — R/F board 12V supply.
7.	Buzzer will not operate at the end of treatment time.	Check the buzzer, buzzer board, Timer/Display board, and P/S — R/F board 12V supply.
8.	Will not change mode.	Check the membrane switch, inter-board connections, and Timer/ Display board.
9.	CW/PULSE display not indicating.	Same as 8.
10.	Will not change W to W/cm^2.	Same as 8.
11.	W or W/cm^2 display not indicating.	Same as 8.
12.	Power meter will not light.	Check Timer/Display board, P/S — R/F board, and inter-connections.
13.	No output power.	Check the applicator and plug, 'GO' SWITCH, P/S — R/F board and Timer/Display board.

TROUBLESHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSE/ACTION
14. No control of intensity.	Check the power control potentiometer and the P/S — R/F board.
15. Unit shuts off shortly after turn-on.	No load on the applicator. Check the P/S — R/F board, applicator and Timer/Display board.

PARTS LIST

Part Number	Description
7001*	Transducer (applicator) Assembly
QH1-10	Power Transformer and Cable Assembly
XH1-05	A/D Control Board
XH1-04	Timer/Display Board
XH1-06	P/S — R/F Control Board
HG1-03	Membrane Switch Assembly
EC4-08	Flat Cable Assembly
HH2-01	Main Power Switch (white)
BD5-02	Power Level Control
XH1-16	Main Power Switch (blue)

*Factory exchange only. You must submit the complete unit for calibration.

APPENDIX

I SONICATOR 706 DRAWINGS

Block Diagram
A/D Control Logic Diagram
Timer/Display Logic Diagram
P/S - R/F Borad Schematic
A/D Control Board Assembly
Timer/Display Board Assembly
P/S - R/F Board Assembly

II SONICATOR 706 TRANSDUCER INSTALLTION ADJUSTMENT PROCEDURE

III SONICATOR 706 COMPLETE SERVICE PARTS LIST

APPENDIX PART II

SONICATOR 706 TRANSDUCER INSTALLATION ADJUSTMENT PROCEDURE

TEST EQUIPMENT REQUIRED

- VARIAC capable of 115 VAC/60 Hz ± 10%.
- Ultrasound watt meter (Ohmic UPM-30, UPM-DT-10, or equivalent).
- Degassed water (for the ultrasound watt meter).
- AC line ammeter for 0 to 1 AMP.

CAUTION

Measurement equipment must be calibrated per manufacturer's requirements to assure valid results.

NOTE: *Prior to a transducer replacement on the 706 units, replace the L6 coil on the power board. Mount with the plastic bolt and nut. Discard metal coil clamp if on old coil.*

EQUIPMENT CONNECTIONS

Oscilloscope.

Note: *R.F. cover must be installed with at least 1 screw in place for adjustment.*

Channel A to J3 (transducer jack) on the power board with the ground clip attached to a suitable ground point.

Channel B to CR13 anode on the power board with the ground clip attached to a suitable ground point.

AMP/DIV controls: 1V/DIV

Time/DIV control (main TB): 0.2 usec/DIV

Place the transducer into the U/S watt meter well, partially filled with degassed water.

EQUIPMENT ADJUSTMENT PROCEDURE

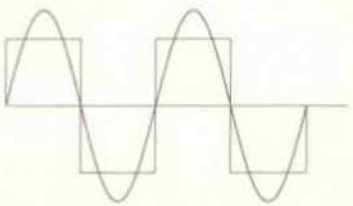
1. Rotate the 706 intensity control to minimum (fully Counter-clockwise).
2. Turn on the 706 by pressing the MAIN POWER SWITCH.

3. Select 22 minutes on the 706 timer by pressing the '2' pad twice and check that the timer indicator shows '22.00' minutes.

4. Press the 'GO' pad and observe that the 706 timer counts down in one second intervals.

5. Adjust L4 for minimum line current. This should be done fast, or you may blow the fuse or L6. Increase the Intensity Control as you tune. When fully tuned you should have less than 500 MA of AC line current with 20w. output on external meter.

   Your oscilloscope display should look like the picture shown below:



NOTE: Sine & square waves will not be the same amplitude.

6. After reaching the minimum current point, for any level of power, a slight adjustment of L4 is allowable if it results in:

   a) An improvement in the pulse envelope.
   b) An improved squaring of the square wave.

7. The two wave forms (sine and square waves), as shown above, should be in phase for the Sonicator 706. If not, adjust C17 on the power board for the proper phase condition.

8. While watching the oscilloscope display, slowly increase the 706 intensity. If the display starts to break up, decrease the intensity to regain normal display and re-adjust L4 without waveform abnormalities.

9. Shift to PULSE mode and check the pulse waveform for abnormalities from minimum to maximum intensity.

10. Change the time/DIV control to 1 MS/DIV to get the picture similar to that shown below:

This waveform should retain its shape as you rotate the 706 intensity control throughout its full range. (The amplitude will change.)

INDICATOR ADJUSTMENT PROCEDURE

1. Put the Sonicator 706 on hold by pressing 'HOLD' pad. Adjust R39, on the power board, for some numerical value on the 706 power output indicator, and then back it down to '0.0'. Just slightly past first '0.0' point.

2. Start the 706 by pressing 'GO' pad. With the 706 intensity control adjusted for 5.0 watts on the U/S wattmeter, adjust R37 on the power board for 5.0 watts on the output indicator.

3. Turn the power control to maximum. The output power should be between 20W & 21W on the test wattmeter. If not, adjust R54 pot. For older units where R54 is not installed the value of R15 needs to be changed between 2K and 5.6K.

4. Adjust the intensity control for 20 watts on the wattmeter adjust R109 on the control board for 20.0 watts on the 706 output indicator.

5. Decrease the intensity to minimum and check for less than 1.0 watts on the U/S wattmeter and on the 706 indicator.

6. Repeat steps 2, 3, 4 and 5 until all are satisfied.

7. While in the CW mode, rotate the intensity control midway between maximum and minimum and lift the transducer out of the wattmeter. (The 706 should cut off in about 6 seconds, the output indicator drops to 0.0, a buzzer sounds at least 5 short beeps, and the timer stops counting).

NOTE: *On some older units without the buzzer board in U8 on the timer display board, the buzzer will not sound on "Auto Cut Off".*

8. If the condition of step 7 is not met, follow the automatic cut-off adjustment procedure.

9. Press 'GO' and increase the power to 20W. The output line current must be below 500ma.

AUTOMATIC CUT OFF ADJUSTMENT PROCEDURE

1. Hook scope probe or DVM to pin 7 of U4 - ground of probe to chassis ground.

2. Turn R26 full clockwise (max R). Note: If R26 is a fixed resistor replace with a trim pot, 20K or clip one end of R26 and substitute a decade box for the following adjustment.

3. Turn the unit on and program for 12 minutes.

4. Place the transducer face end under water.

5. Press go and observe the timer counting down and output in the water. Set the output to 4 watts.

6. Lift the transducer out of water and decrease the value of R26 (ccw) until the voltage at pin 7 of U4 changes to a high state (approx. 10V).

7. Turn the intensity knob to increase the power to max and observe the voltage at pin 7 of U4 remains high (about 10V).

8. If conditions of steps 6 & 7 are not met turn R26 slightly more counter clockwise and check again. Do not adjust R26 more counterclockwise than necessary to achieve the above results.

9. Lock R26 with torque seal or other non permanent "glue".

10. If a decade box was used for the above, replace R26 with the indicated value.

APPENDIX PART III
SONICATOR 706 SERVICE PARTS LIST

PARTS LOCATION	DESCRIPTION	PART NUMBER
MISCELLANEOUS PARTS & ASSEMBLIES		
	FRONT HOUSING COMPLETE W/MEMBRANE SWITCH	XH1-10
	BACK COVER WITH STUD	XH1-15
	HANDLE	WKR2-03
	706 TIMER DISPLAY BOARD	XH1-04
	706 A-D BOARD	XH1-05
	706 POWER BOARD	XH1-06
	706 BUZZER BOARD	XH1-09
	POWER CORD ASSEMBLY	QH1-05
	AC POWER SWITCH (WITH BLUE TOP)	XH1-16
	BLUE SWITCH TOP (ONLY)	KD1-09
	AC POWER SWITCH (WHITE TOP)	HH2-01
	POWER SWITCH CABLE ASSLY	QH1-07
T1	POWER TRANSFORMER & CABLE	QH1-10
	MEMBRANE SWITCH (FRONT PANEL)	HG1-03
R16	INTENSITY CONTROL POT 5K	BD5-02
	KNOB FOR ABOVE	KD1-06
	INTENSITY CONTROL CABLE ASSLY	QH1-08
	RIBBON (FLAT) CABLE ASSY	EC4-08
	RUBBER FEET	KA1-03
	HEX STAND OFFS	KL1-02
	TRANSDUCER (7001)	XH1-02
	BLACK GROUND JACK	ED3-11
	4 POINT GROUND TERMINAL	EB3-03
	LABEL 706 METTLER	PA2-01
706 POWER BOARD PARTS		
CR11	DIODE MR851	AA1-05
CR1-6,9,25	DIODE 1N4002	AA1-06
CR14-20,23	DIODE 1N4148	AA1-07
CR10	DIODE 1N4737	AA1-08
CR12,13	DIODE 1N4935	AA1-09
CR7,8	DIODE 1N5392	AA1-10
CR24	DIODE-ZENER 1N4753	AA3-02
Q1,6	TRANS 2N2222A	AB1-01
Q2	TRANS 2M2907A	AB2-05
Q4,5	TRANSISTOR D44C11 NPN	AB5-05
Q3	TRANS D45H10 PNP	AB5-06
Q7	TRANS, 2N4351 TO-72	AB6-05
U1	REGULATOR VOLTAGE	AD1-07
U2	REGULATOR VOLT 7912CT	AD2-01
CR22	TRANSZORB SA75A,SA78A	AD3-01
R23	RES 2K OHM 1/2W	BB3-09
R15	RES 750 OHM 1/4W 5%	BC2-14
R25,50	RES 12K 1/4W 5%	BC22-01
R30	RES 24K 1/4W 5%	BC22-04
R32	RES 27K OHM 1/4W 5%	BC22-05

SONICATOR 706 SERVICE PARTS LIST

PARTS LOCATION	DESCRIPTION	PART NUMBER
706 POWER BOARD PARTS (CONT'D)		
R41,33	RES 43K 1/4W 5%	BC22-06
R34,35	RES 51K OHM 1/4W 5%	BC22-07
R38	RES 62K OHM 1/4W 5%	BC22-08
R42,52	RES 100K OHM 1/4W 5%	BC22-10
R24	RES 200K OHM 1/4W 5%	BC22-13
R36	RES 240K OHM 1/4W	BC22-14
R27	RES 290K OHM 1/4W	BC22-16
R5,17-19,40,47	RES 1 MEG 1/4W 1%	BC22-18
R21,22	RES 20 OHM 1/4W	BC22-20
R12	RES 33 OHM 1/4W 5%	BC22-21
R51	RES 100 OHM 1/4W	BC22-22
R29	RES 160 OHM 1/4W 5%	BC22-23
R13	RES 200 OHM 1/4W 5%	BC22-24
R49	RES 300 OHM 1/4W 5%	BC22-25
R10	RES 510 OHM 1/4W 5%	BC22-26
R6-9,44,45	RES 1K OHM 1/4W 5%	BC22-28
R4,14	RES 2K OHM 1/4W 5%	BC22-30
R53	RES 10 OHM 1/4W 5%	BC22-31
R31	RES 3.3K OHM 1/4W 5%	BC22-35
R20	RES 3.6K OHM 1/4W	BC22-36
R11	RES 4.3K 1/4W 5%	BC22-38
R43,48	RES 5.1K 1/4W 5%	BC22-40
R1,3,28	RES 10K OHM 1/4W 5%	BC22-42
R26	RES 7.5K OHM 1/4W	BC22-43
R54	POT 5K 1/2W MULTITURN "W"	BD2-05
R37	POT 20K 1/2W PCMT "F"	BD3-03
R39	POT 1 MEG 1/2W PCMT "F"	BD3-05
C18	CAP 1500 PF 100V (M)	CA1-10
C20,24-26	CAP .1 MF 100V CER	CA1-11
C14,33	CAP 2000PF 500V	CA1-12
C2,3	CAP 470 PF 3KV CER DISC	CB1-03
C1	CAP .02 MF 600V CER	CB2-01
C21	CAP .022 MF 50V (C)	CB2-02
C19	CAP .01 MF 500V	CB2-05
C7	CAP .001 MF 50V	CB2-16
C27,28,29	CAP .1 MFD 50V	CB2-18
C23,31,32	CAP 150 PF 50V (C)	CB2-19
C16	CAPACITOR 22V .022 MFD	CC2-14
C9	CAP .47 MF 100V	CC2-15
C15	CAP .22 MFD 250V	CC2-16
C10	CAP .01 MF 400V (MY)	CC2-17
C34	CAP .005 MF 50V (C)	CC2-18
C6	CAP 1.0 MF 35V TANT EL	CD1-01
C5	CAP ALUM-ELEC 680UF, 35V	CD2-16
C11	CAP 10 MF 50V AX EL	CD2-27
C12	CAP 3300 MF 50V (A)	CD2-28
C4	CAP 33 MF 50V (A)	CD2-29
C8,22,30	CAP 10 MF 35V (A)	CD2-30
C17	CAPACITOR TRMR VRBLE	CE2-01

SONICATOR 706 SERVICE PARTS LIST

PARTS LOCATION	DESCRIPTION	PART NUMBER
706 POWER BOARD PARTS (CONT'D)		
L1,2	INDUCTOR 1.2MH TOROID	DA1-03
T2	TOROID 10717	DA1-10
L3	INDUCTOR TOROID 500MH	DA1-11
L5	TOROIDAL INDCTR 12MH	DA1-12
L6	INDUCTOR, CP CORE	XH1-12
T3	TRANSFORMER CP CORE	XH1-14
T4	TRANSFORMER CP CORE	XH1-13
L4	INDUCTOR TUNEABLE	DB2-01
L7	CHOKE 33 MH 9360-09	DI2-01
L8	FERRITE CORE WIRE ASSLY	QH1-17
J3	JACK, RCA FEM. COAX	EC2-07
XU3,4	SOCKET IC 14 PIN	EC7-02
XU5	SOCKET, IC 16 PIN	EC7-03
J5	HEADER 3 PIN	ED4-02
J1	HEADER 11 PIN	ED4-03
J4	HEADER 5 PIN	ED4-04
J2	HEADER (ENC.) 11 PIN	ED4-12
F1,2	FUSE .5 AMP 250V SLO-BLO	FA1-04
XF1,2	FUSE CLIP PC MNT 1/4"	FC2-02
CS1	CABLE SUPPORT POST	GG1-07
FC1	INSULATOR, FUSE	KN1-06
Q3,4,5	INSULATOR, TRANSISTOR MYLAR	K01-01
Q3,4,5,U1	INSULATING WASHER, TRANS	K01-02
U1	HEATSINK 6025 BIT	L11-02
Q4,5	HEATSINK, LONG 10706	LI1-03
Q3	HEATSINK, SHORT 10707B	LI1-04
U3	IC VOL REG LM723CN	RC1-01
U5	IC CA3280E	RD1-01
U4	IC LM324N QD OP AMP	RF1-04
SPK1	BUZZER CMB12	SA1-01
706 TIMER DISPLAY BOARD PARTS		
CR1-8	DIODE 1N4148	AA1-07
Q1	TRANS 2N2222A	AB1-01
R11,12,14-17	RES 22K OHM 1/4W 5%	BC22-03
R1,2	RES 100K OHM 1/4W 5%	BC22-10
R3-9	RES 510 OHM 1/4W 5%	BC22-26
R10,18-21	RES 1K OHM 1/4W 5%	BC22-28
R13,22	RES 10K OHM 1/4W 5%	BC22-42
C7	CAP .001 MF 50V	CB2-16
C3-6,8	CAP 150 PF 50V (C)	CB2-19
C1,2	CAP 1.0 MF 35V TANT EL	CD1-01
C9	CAP 10 MF 50V EL RD	CD2-32
U8 (FOR BUZZER BOARD)	SOCKET IC 14 PIN	EC7-09
J2	HEADER 12 PIN	ED4-06
J3	HEADER CONNECTOR 26 PIN	ED4-08
J1	HEADER 11 PIN	ED4-12

SONICATOR 706 SERVICE PARTS LIST

PARTS LOCATION	DESCRIPTION	PART NUMBER
706 TIMER DISPLAY BOARD PARTS, (CONT'D)		
FOR DS1-7	SPACER DISPLAY 10716	KK1-08
LED 1-4	DIODE, LIGHT EMIT SBG5633	NB1-03
DS 1-7	DISPLAY 7 SEG DIGITAL RED	NB2-01
U4,7	IC 4081 QUAD 1INPT AND	RA1-01
U2,10	IC 4001 QUAD 1INPUT NOR	RA1-02
U6	IC, DISPL DRIVR MC1416P	RB1-01
U5	IC COUNTER TIME MK50396N	RD1-02
U1	IC KEY ENCODER MM74C922N	RD1-05
U3,9	IJC 4013 DUAL F-FLOP	RE1-03

NOTE: U8 *706 BUZZER BOARD PARTS*
IT IS RECOMMENDED THAT THE BUZZER BOARD BE REPLACED IF NEEDED AND NOT REPAIRED...SEE MISCELANEOUS PARTS.

706 A TO D PC BOARD PARTS		
CR101-103	DIODE 1N4148	AA1-07
U102	REGULATOR VOL 78L05A	AD1-06
R103	RES 68K OHM 1/4W 5%	BC22-09
R111,123	RES 100K OHM 1/4W 5%	BC22-10
R102	RES 240K OHM 1/4W 5%	BC22-14
R107	RES 300K OHM 1/4W 5%	BC22-15
R101	RES 1 MEG 1/4W 5%	BC22-19
R112	RES 160 OHM 1/4W 5%	BC22-23
R110,116-122	RES 200 OHM 1/4W 5%	BC22-24
R108	RES 510 OHM 1/4W 5%	BC22-26
R114,115	RES 1K OHM 1/4W 5%	BC22-28
R113	RES 5.1K 1/4W 5%	BC22-40
R109	POT 200 OHM 1/2W OCMT "F"	BD3-04
C108	CAP 250 PF 50V	CB2-17
C102	CAP .1 MFD 50V	CB2-18
C103	CAP 1 MF 50V RDL EL	CC1-01
C101	CAPACITOR 220V .022MFD	CC2-14
C104,107	CAP .47 MF 100V	CC2-04
C105,106	CAP 10 MF 50V EL RD	CD2-32
P3	CONN, 26 PIN DUAL HSG	EC7-05
U101	IC 4001 QUAD 2 INPUT NOR	RA1-02
U103	IC DVM ADD 3701CCN	RD1-04